

## LI/V AS AN INDICATOR OF THE REDOX STATE OF MORB SOURCES

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Recent observations by Ryan and Langmuir (1987) show that the Li/V ratio has a nearly constant value of 0.02 in MORB suites from the Tamayo Fracture Zone (TFZ) and FAMOUS area and that this value is essentially identical to that determined in peridotite xenoliths (0.021) analysed by Jagoutz et al. (1979). These observations imply that the bulk mantle/melt partition coefficients for lithium and vanadium are similar. Although the partition coefficients for lithium between mantle minerals (olivine, opx, cpx) and silicate melt are unlikely to vary with  $fO_2$ , values for vanadium have been shown to be highest at low  $fO_2$  (IW) and steadily decrease as  $fO_2$  increases (Canil, 1996; Lindstrom, 1976). The prevailing redox state during MORB genesis can thus be estimated by determining the  $fO_2$  at which the calculated mantle/melt partition coefficient for vanadium is equivalent to that for lithium.

In our calculations, we have used the olivine-, cpx-, and opx-basaltic melt partition coefficients for lithium measured at 1.0 GPa and 1200 C and reported by Neroda (1996). Partition coefficients for vanadium as a function of  $fO_2$  are based on regressions of the data of Canil (1996) for olivine and Lindstrom (1976) for clinopyroxene. Values for orthopyroxene were taken from Kennedy et al. (1993) and assumed to have the same  $fO_2$  dependence as values for olivine. Calculations were done using a residual assemblage that contains 60:40 wt. proportions of olivine:opx and 0 to 10 wt% cpx. Calculations indicate that the bulk partition coefficient for Li is equal to that of vanadium at  $fO_2$ s ranging from IW + 0.5 (no residual cpx) to IW + 3 (10% residual cpx). Measured oxygen fugacities based on ferric-ferrous equilibria in basalts from the TFZ and FAMOUS areas range from IW + 1 to IW + 3.5 (Christie et al., 1986). Thus, for a reasonable range of residual cpx contents, the  $fO_2$  range indicated by the observed Li/V ratio is in very good agreement with that determined by ferric-ferrous equilibria. Our results further support the contention by Carmichael (1991) regarding the ability of magmas to preserve their source-region redox state subsequent to transport and eruption.

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